

## PATENT SPECIFICATION

(11) 1 465 007

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- (21) Application No. 18118/74 (22) Filed 25 April 1974  
 (31) Convention Application No. 7306527  
 (32) Filed 9 May 1973 in  
 (33) Sweden (SW)  
 (44) Complete Specification published 16 Feb. 1977  
 (51) INT CL<sup>2</sup> A61G 7/08  
 (52) Index at acceptance  
 A4U 2  
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(54) MOVABLE SUPPORT STRUCTURE, FOR EXAMPLE  
 FOR A HOSPITAL BED

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 MISK FÖRENING, a Swedish  
 incorporated economic association of  
 Svetsarvägen 20, S-171 41 Solna, Sweden,  
 do hereby declare the invention for which  
 we pray that a patent may be granted to us,  
 and the method by which it is to be  
 performed, to be particularly described in  
 and by the following statement:—

The present invention relates to a  
 movable support structure, for example for  
 a hospital bed, and of the type having legs  
 upon which it can rest and castor wheels by  
 which it may be moved.

According to the present invention there  
 is provided a movable support structure, for  
 example for a hospital bed, including a  
 framework comprising interconnected  
 pairs of front and rear legs, a castor wheel  
 adjacent each leg and supported for  
 rotation on an arm pivoted to the  
 framework, the arms being pivotable so as  
 to lower and raise the castor wheels relative  
 to the legs between first and second  
 positions wherein, respectively, the  
 structure is supported by the castor wheels  
 and by the legs, each castor wheel being so  
 mounted on its associated arm that when in  
 the first position, it is pivotable about a  
 vertical axis whereby, when the structure is  
 moved on the castor wheels in any direction  
 the axes of rotation of the castor wheels will  
 be rearward of the vertical axes in that  
 direction, the pivoted arms being  
 connected in front and rear pairs to form  
 front and rear stirrups and the pivoted arms  
 of the front stirrup being connected to  
 those of the rear stirrup by parallel struts, a  
 foot pedal lever by which the pivoted arms  
 may be pivoted by foot pressure to lower the  
 castor wheels to the first position, a latch for  
 retaining the foot pedal lever and thereby  
 the pivoted arms in the first position and  
 spring means arranged to assist pivoting of  
 the foot pedal lever and thereby the pivoted  
 arms to raise the castor wheels to the  
 second position upon release of the latch,

and to retain them in that position, wherein,  
 when the castor wheels are in the first position  
 and are rotated about the vertical axes to  
 the position assumed upon movement of  
 the structure on the castor wheels in one of  
 the directions of movement of the structure  
 parallel to its longitudinal axis, the  
 distances between the vertical planes  
 through the pivot points of the pairs of  
 pivot arms and vertical lines through the  
 axes of rotation of the associated castor  
 wheels are less than the distances between  
 the vertical axes and the axes of rotation of  
 the castor wheels and, when the castor  
 wheels are in the first position, the bottoms  
 of the legs of the each pair lie within  
 imaginary cylinders developed between the  
 associated pairs of castor wheels when  
 these are rotated about the vertical axes to  
 the positions assumed upon movement of  
 the structure on the castor wheels in either  
 direction of movement of the structure  
 parallel to its longitudinal axis.

With a structure of the invention, in one  
 direction of travel, in the lengthwise  
 direction of the structure, the castor wheels  
 will take up such a position in relation to  
 the pivoting axes of the pivoted arms  
 carrying the castor wheels, that the turning  
 movement needed to keep the wheels down  
 is small, so that only small forces occur in  
 the operating system to raise and lower the  
 wheels and only a small pressure on the  
 pedal is required to raise or gently lower the  
 structure.

In addition, because the bottoms of the  
 legs are in the position relative to the  
 castors as described it is the case that at  
 least when the structure is moved  
 longitudinally there is no possibility of the  
 legs engaging any threshold over which the  
 wheels ride.

The invention will be more clearly  
 understood from the following description  
 which is given by way of example only with  
 reference to the accompanying drawings, in  
 which:

Fig. 1 is a longitudinal section through a

structure of the invention, with the castor wheels lowered;

Fig. 2 shows the same structure with the castor wheels raised; and

5 Fig. 3 is an enlarged detail of the right hand castor wheel in the other Figures wherein it is shown in full lines in the same position as in Fig. 1, and in chain lines for the position corresponding to the opposite direction of travel.

10 In Figures 1 and 2, a leg frame structure is denoted by the numeral 1, and is provided at either end with a pair of legs, only one being shown at each end of the structure, these being indicated at 2 and 3, respectively.

At each end, on either side of the longitudinal central plane of the structure there is a pivoted arm again only one arm at each end being shown at 4 and 5. The arms are pivotally mounted on respective transverse shafts 6 and 7, which are supported by the leg frame structure. The two arms at each end of the structure are fixed together to form a stirrup. Interconnecting the stirrups are parallel struts 8, one on each side of the leg frame structure, for carrying out swinging movements simultaneously. The system comprising the arms 4, 5 and struts 8 is actuated by a foot pedal lever 9 with a foot plate 9a, the pedal lever being pivotally mounted on a horizontal shaft 10. Shaft 10 is supported by brackets 11 welded to the structure. The pedal lever has an upwardly directed arm 12 with a slot 13 at its upper edge, in which is engaged a pin 14 on the strut 8.

Between the structure and the parallel strut 8 there is a spring 15, biased to urge strut 8 in a direction to move arms 4, 5 into the position shown in Fig. 2, in which wheels 20 mounted on the bottoms of the arms raised from the ground.

45 On the foot pedal lever 9 there is a latching arm 16 pivoted on a pin 19 and acted upon by a spring 17. In the latched position shown in Fig. 1, arm 16 coacts with a boss 18 on the structure to keep strut 8 in the position shown. When that latching arm is moved from its latched position by swinging about pin 19, the pedal 9 is free to rotate and can be used to rotate the arms 4, 5 so as to let the structure down to the position in Fig. 2.

The precise arrangement of the castor wheel, shown at the right in Fig. 1 will now be described. The left castor wheel is arranged in the same way.

60 The castor wheel 20 is mounted in a fork 21 for rotation about an axis 25. Fork 21 is turnable about an axis 22 (Fig. 3) parallel to the length of arm 5 so that the castor wheel can be turned round and the axis 25 will be behind axis 22 when the structure is pushed

in any direction. In Fig. 1 the castor wheel is in a position for travel of the structure to the right in the Figure. This position is represented by the full line showing in Fig. 3. Turning the castor wheel fork 21 about axis 22 through 180° puts the castor wheel in the position shown in chain lines in Fig. 3, which is the position for travel of the structure in the opposite direction.

70 In Figs. 1 and 3, a vertical plane 23 is shown by a chain line through the shaft 7 on which are pivoted both the arms 5 arranged at this end of the structure. In these Figures there is also shown a vertical line 24 through the central axis 25 of the castor wheel 20. The distance between plane 23 and the vertical line 24 is denoted by X. This distance should be as small as possible, and at most, less than the radial distance between the turning axis 22 of the fork and the castor wheel central axis 25. Accordingly, in the position shown in Fig. 1, the turning moment on the arms 5 about shaft 7 will be correspondingly smaller for a smaller distance X. Because of this, the foot pressure required on foot plate 9a to balance this turning moment by a moment applied to arms 5 via pedal lever 9 and strut 8 will be correspondingly small. When the latch 16 is slipped, therefore, one can retain the structure in the Fig. 1 condition by foot pressure, and lower the structure to the Fig. 2 position with a relatively small countering foot force, without difficulty and with great security. This is of the greatest importance in enabling the operating mechanism of the structure to be used with safety by persons having small foot pressure capacity and relatively low body weight.

105 It may also be seen from Figs. 1 and 3 that at both ends of the structure, the lower ends of legs 2 and 3 will lie within an imaginary cylinder developed between the two castor wheels 20 at the corresponding end when these are set for travel in either longitudinal direction. The arrangement of the leg ends in relation to the castor wheels in this respect is clearly seen in Fig. 3. It is ensured by this arrangement that the ends of the legs can never knock against a threshold over which the castor wheels roll, at least when the structure is pushed in either longitudinal direction.

Accordingly there is no risk of an abrupt stop caused by the legs knocking against a threshold, which can happen with other known arrangements.

#### WHAT WE CLAIM IS:—

1. A movable support structure, for example for a hospital bed, including a framework comprising interconnected pairs of front and rear legs, a castor wheel adjacent each leg and supported for

rotation on an arm pivoted to the framework, the arms being pivotable so as to lower and raise the castor wheels relative to the legs between first and second positions wherein, respectively, the structure is supported by the castor wheels and by the legs, each castor wheel being so mounted on its associated arm that when in the first position, it is pivotable about a vertical axis whereby, when the structure is moved on the castor wheels in any direction the axes of rotation of the castor wheels will be rearward of the vertical axes in that direction, the pivoted arms being connected in front and rear pairs to form front and rear stirrups and the pivoted arms of the front stirrup being connected to those of the rear stirrup by parallel struts, a foot pedal lever by which the pivoted arms may be pivoted by foot pressure to lower the castor wheels to the first position, a latch for retaining the foot pedal lever and thereby the pivoted arms in the first position and spring means arranged to assist pivoting of the foot pedal lever and thereby the pivoted arms to raise the castor wheels to the second position upon release of the latch, and to retain them in that position, wherein, when the castor wheels are in the first position and are rotated about the vertical axes to the positions assumed upon movement of the structure on the castor wheels in one of the directions of movement of the structure parallel to its longitudinal axis, the distances between the vertical planes through the pivot points of the pairs of pivot arms and vertical lines through the axes of rotation of the associated castor wheels are less than the distances between the vertical axes and the axes of rotation of the castor wheels and, when the castor wheels are in the first position, the bottoms of the legs of each pair lie within imaginary cylinders developed between the associated pairs of castor wheels when these are rotated about the vertical axes to the positions assumed upon movement of the structure on the castor wheels in either direction of movement of the structure parallel to its longitudinal axis.

2. A movable support structure according to claim 1 wherein the foot pedal lever engages one of the parallel struts.

3. A movable support structure substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1977  
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of  
the Original on a reduced scale*

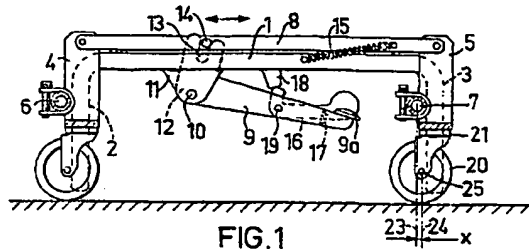


FIG. 1

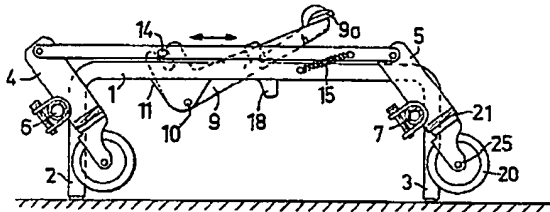


FIG. 2

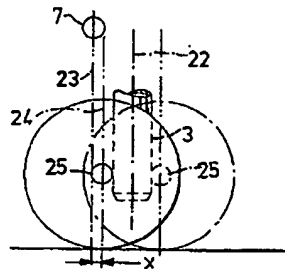


FIG. 3